

Renewable Energy Supply-Side Options

Laura Vimmerstedt

State and Local Climate Change
Partners' Conference

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“Take Home” Overview

- Every Area Has Renewable Energy Resources
- State and Local Renewable Energy Policies Matter for Implementation
- Innovations and Strategic Opportunities
 - Supplemental Environmental Projects
 - Partnerships

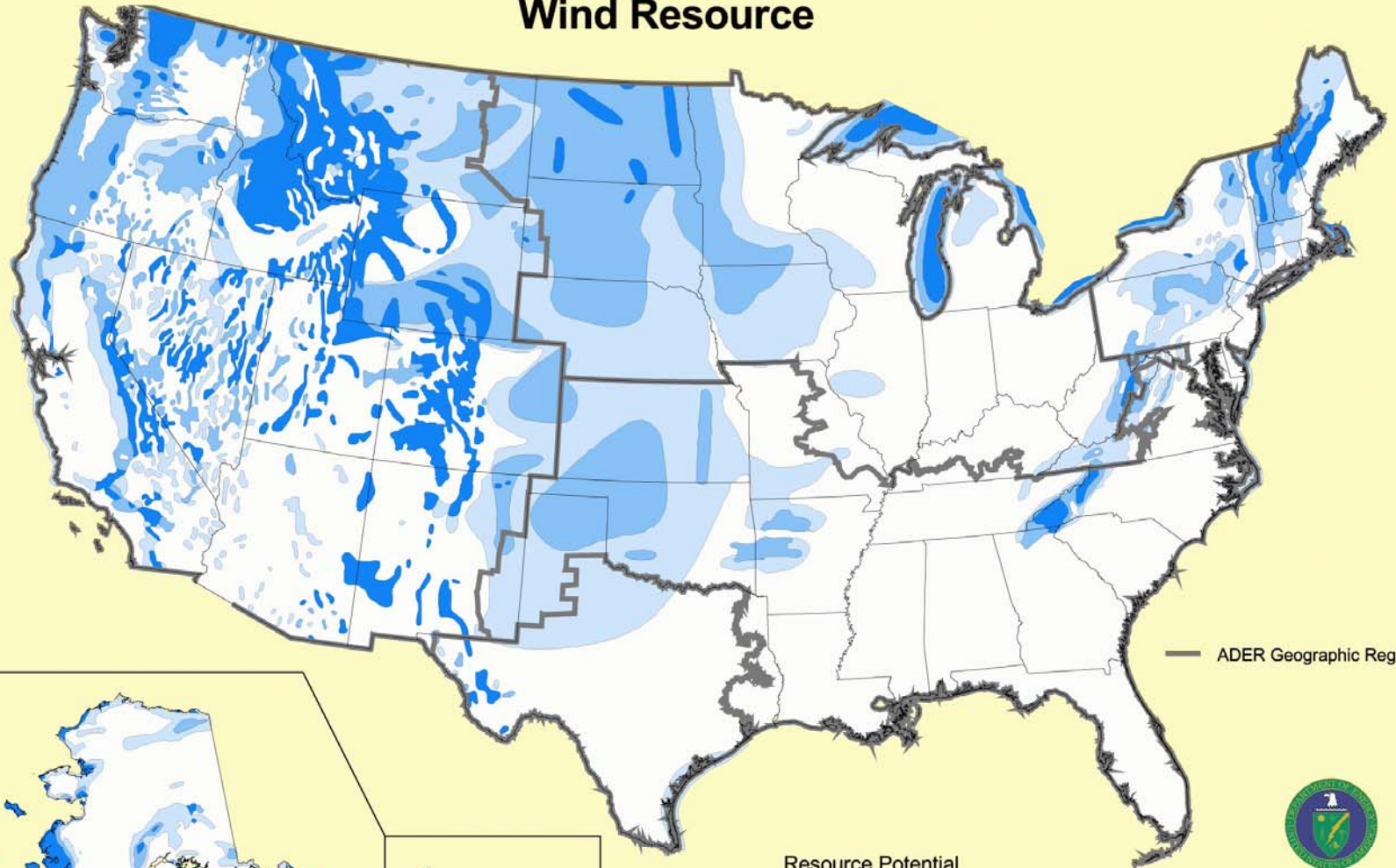


Renewable Energy Resources

- Every area of the country has useable renewable energy resources
- Quality of resource varies, and contributes to cost of energy
- Resource assessment & mapping: Work in progress, many levels of detail



Wind Resource



— ADER Geographic Regions

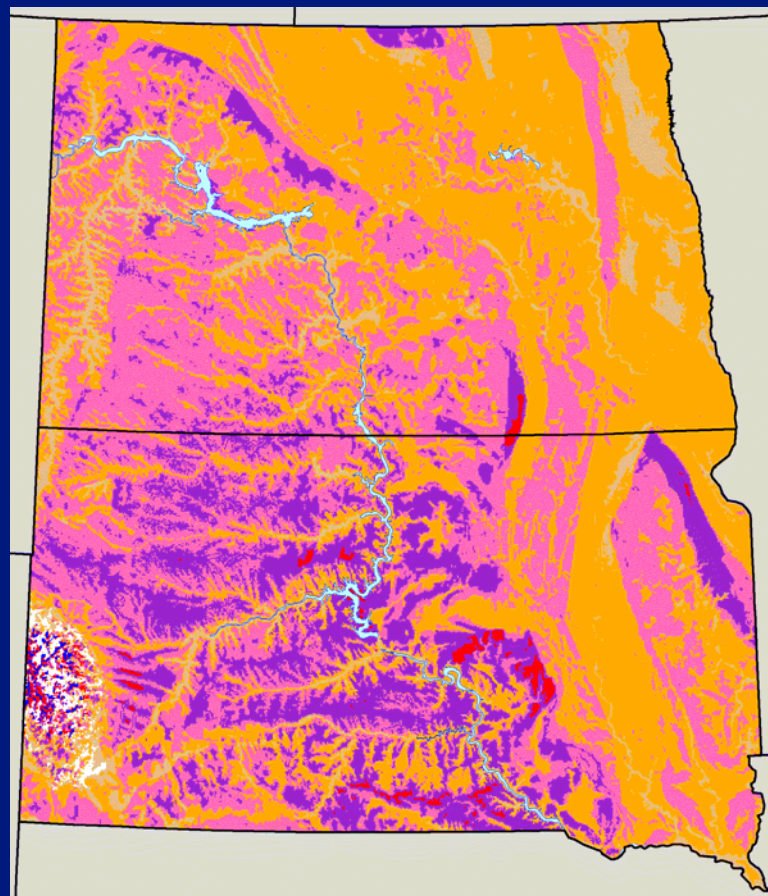
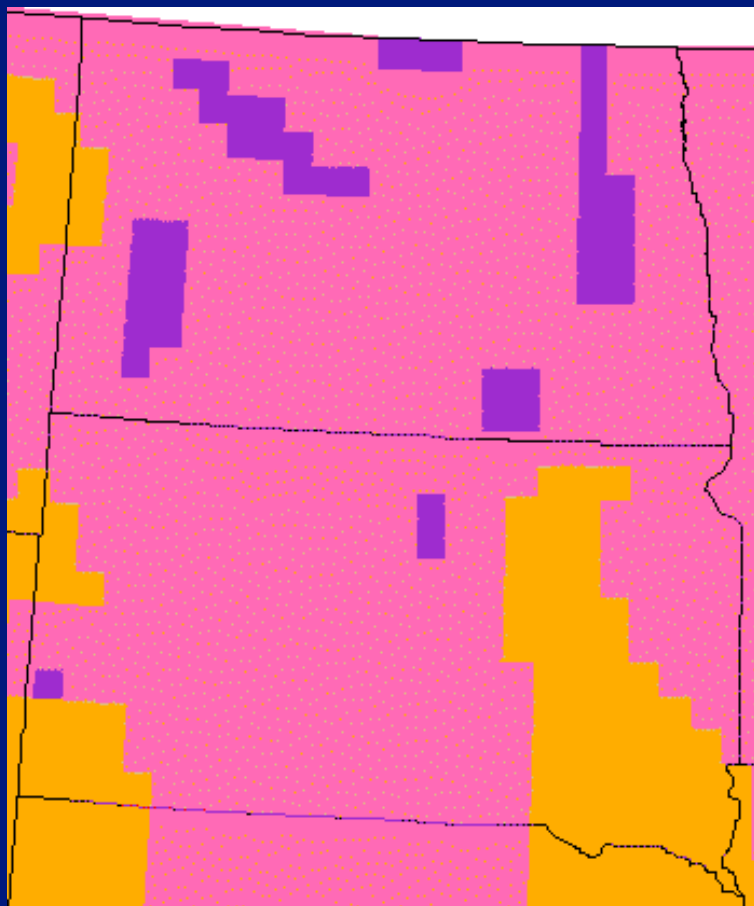
Resource Potential



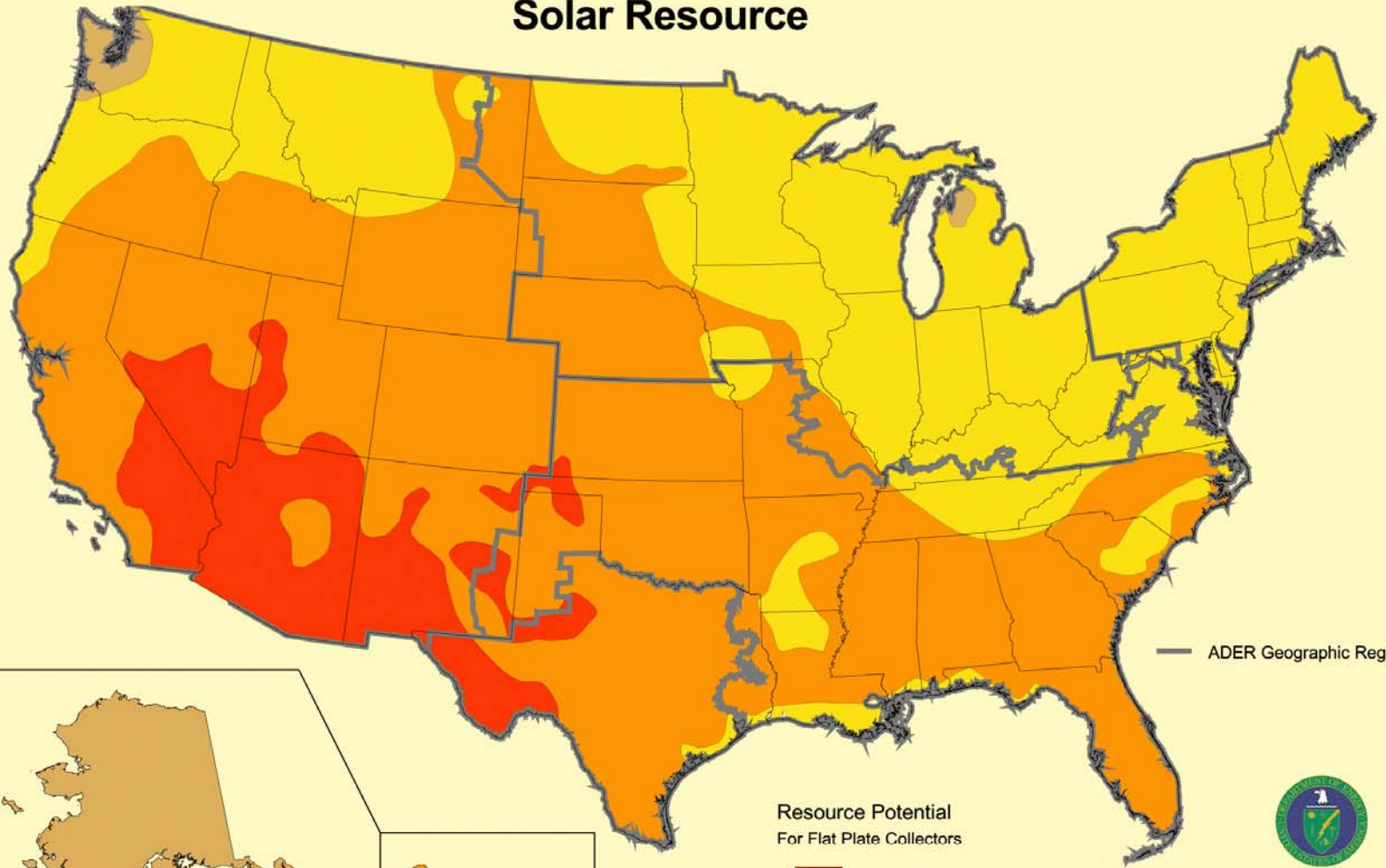
Data Source:
National Renewable Energy Laboratory



1987 U.S. Wind Atlas Map vs. 2000 High-Resolution (1-km²) Wind Map of North and South Dakota



Solar Resource



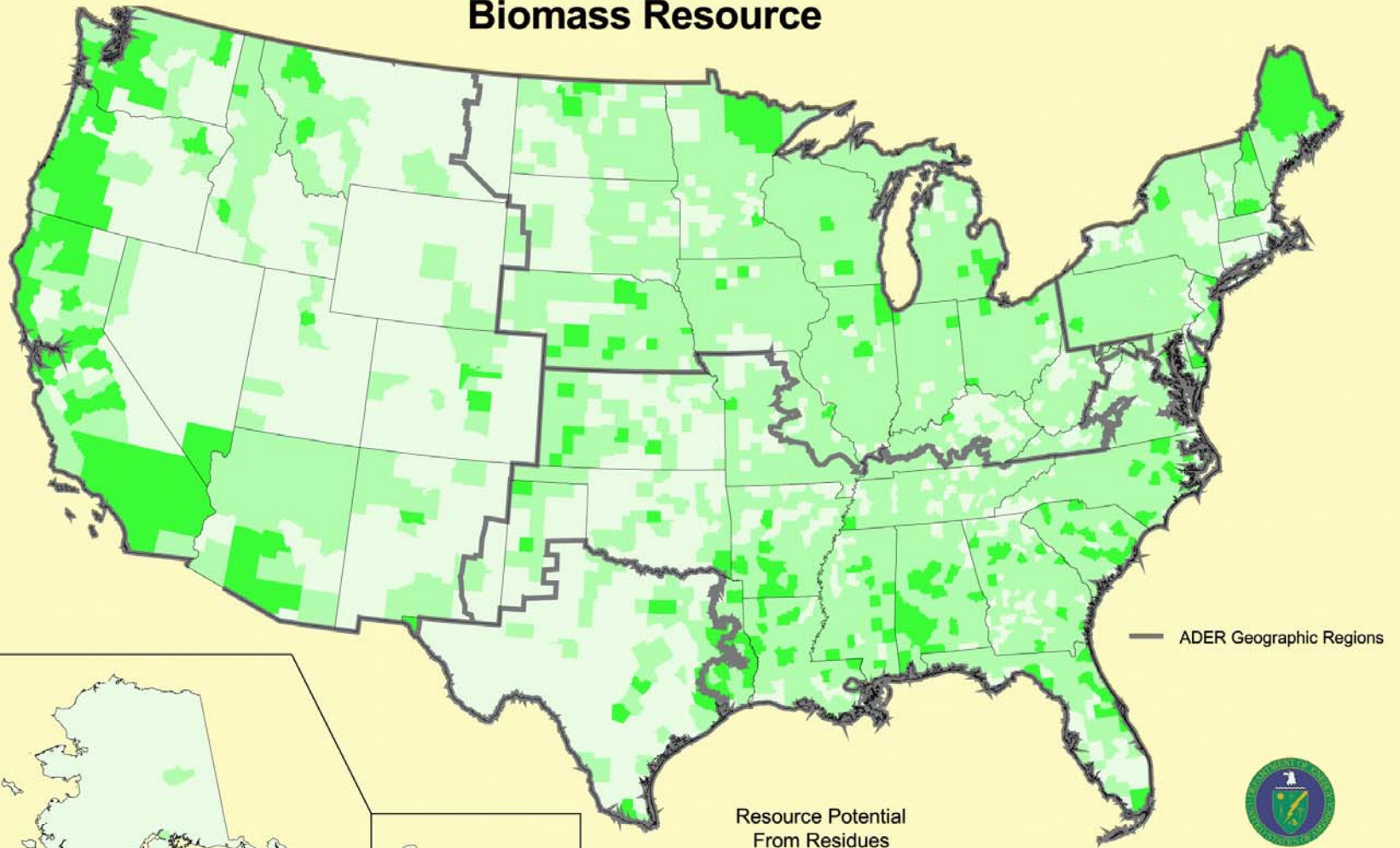
Resource Potential
For Flat Plate Collectors



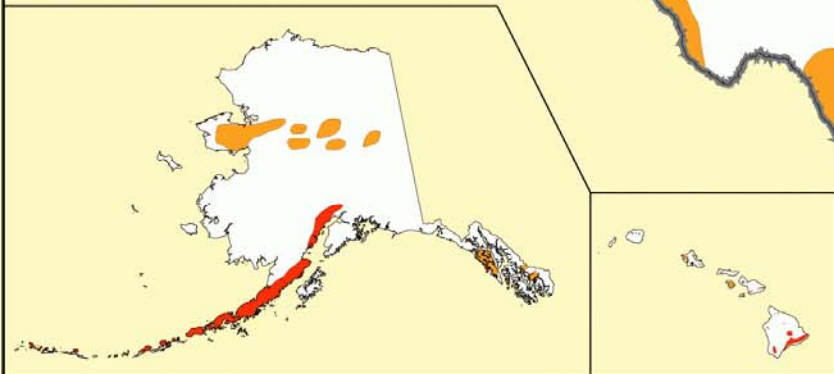
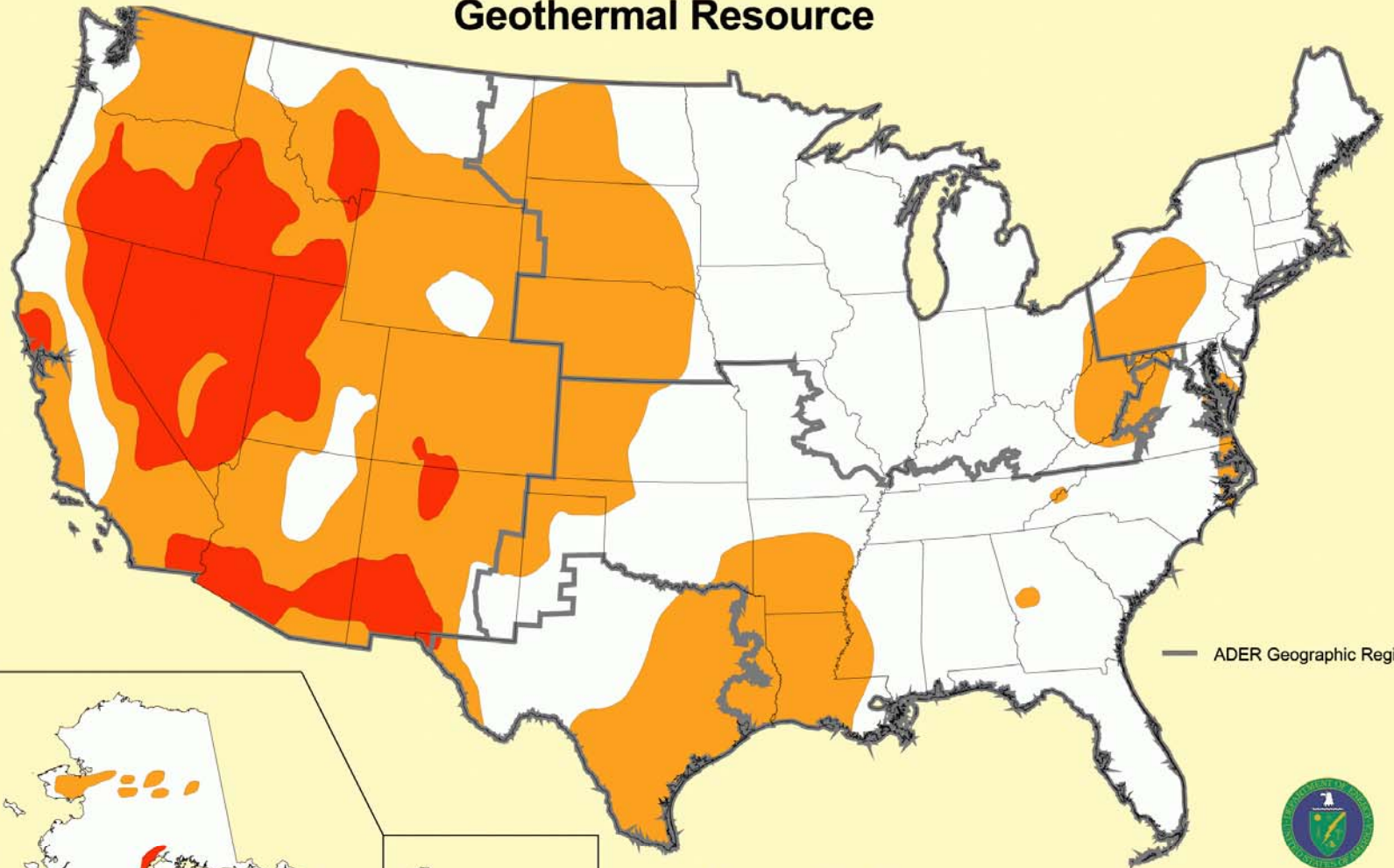
Data Source:
National Renewable Energy Laboratory



Biomass Resource



Geothermal Resource



Resource Potential

- Excellent
- Good

Data Source:
Southern Methodist University Geothermal Laboratory
Alaska Department of Natural Resources
Hawaii Dept. of Business, Economic Development and Tourism



State and Local Renewable Energy Policies Matter for Implementation

- What Policies Provide Incentives?

- Green Power
- Renewable Portfolio Standards
- Renewable Energy Funds

Customer-Sited PV:

- Net metering
- Interconnection Standards
- Tax credits, Buy-downs, Grants
- Loans

- Why Do Policies Matter?

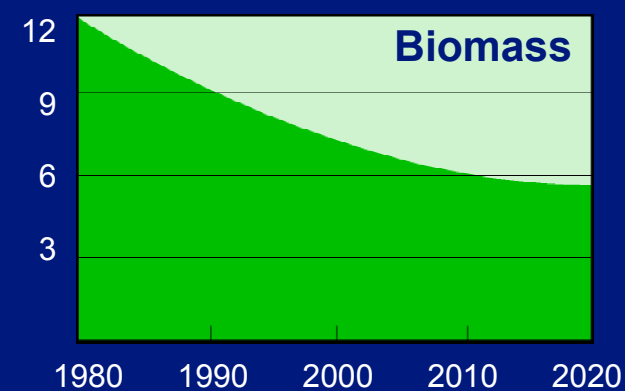
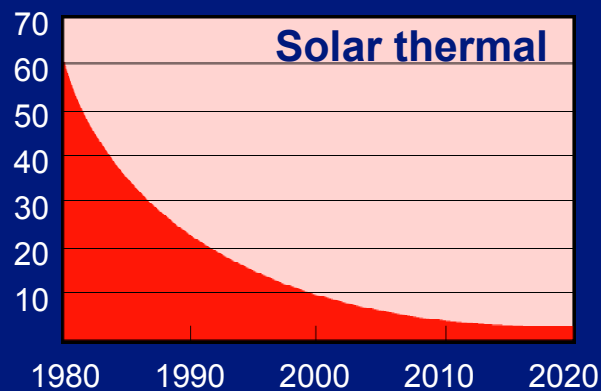
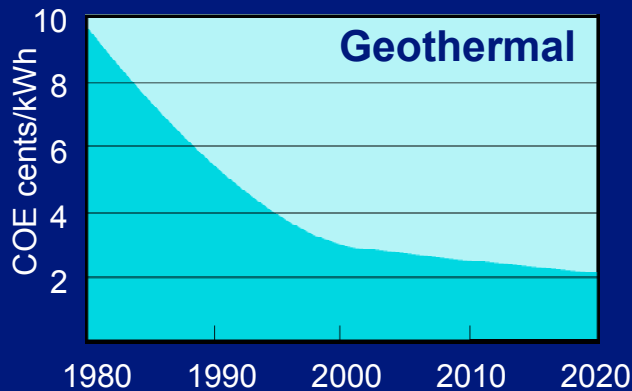
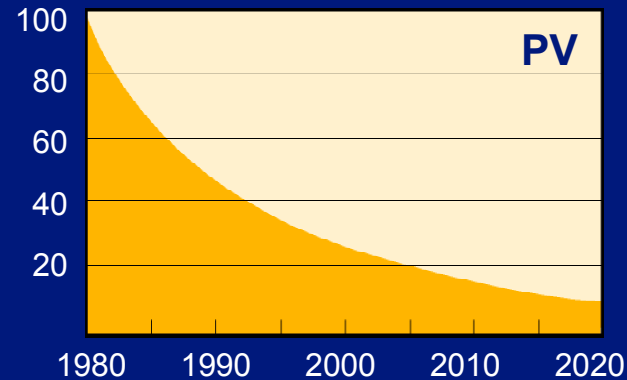
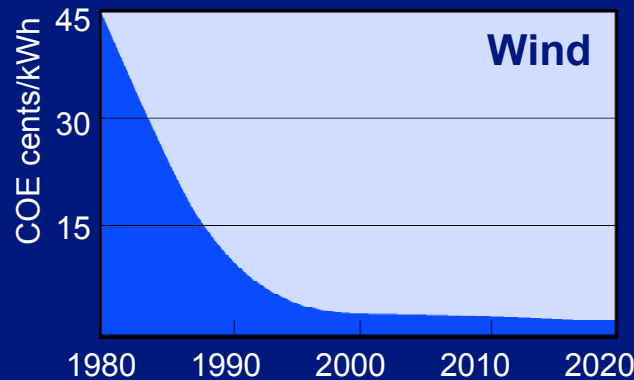
- New Technology: Market Transformation Issues
- Relative Costs

- Technology-Specific Examples



Renewable Electricity Cost Trends

Levelized cents/kWh in constant \$2000¹



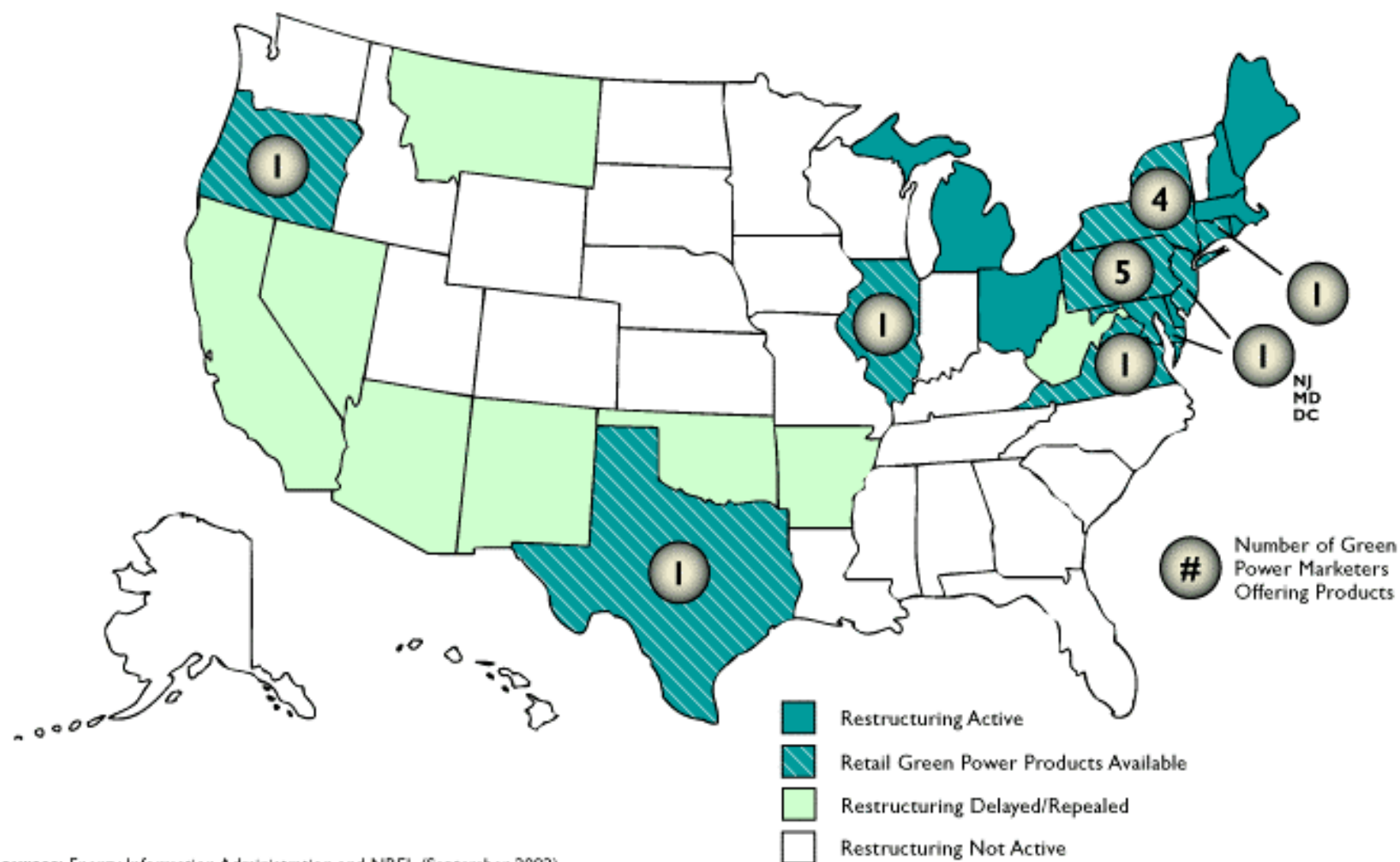
Source: NREL Energy Analysis Office
Updated: June 2002

Status of Renewable Energy Policies

- **Green power**
 - Nearly 40% of U.S. electricity customers
 - More than 1,000 MW of new renewables-based capacity
- **Renewable Portfolio Standards**
 - 13 states
 - 1% to 30% of total power supply
 - 33% of retail load nationwide
- **Renewable energy funds**
 - 16 states
 - \$3.6 billion total through 2012

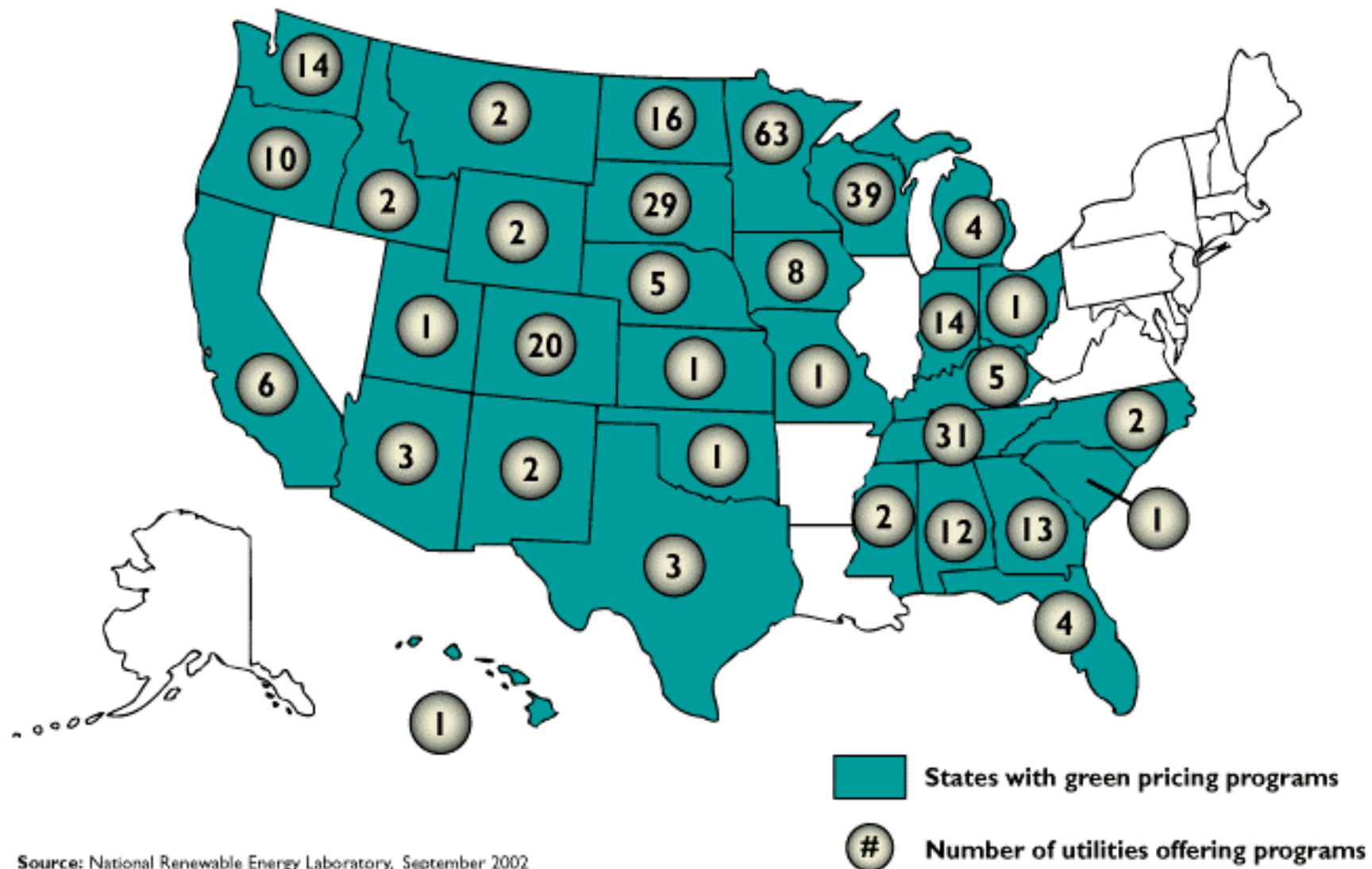


Green Power Marketing Activity in Competitive Electricity Markets



Sources: Energy Information Administration and NREL (September 2002)

Utility Green Pricing Activities



Source: National Renewable Energy Laboratory, September 2002

State Policies are Promoting New Renewables Development

- **New York**

- 350 MW of new wind energy will be in place by end of 2003.

Contributing Factors:

- SBC collects funds for renewable energy development
- Federal production tax credit for wind energy
- Market enables green power purchases



Fenner Wind Project - New York (30 MW)



State-Level Green Power Purchase Commitments

- **Maryland**
 - Executive Order: 6% of state facilities' electricity consumption
 - RFP calls for 20%
- **New York**
 - Executive Order: 10% by 2005 and 20% by 2010
- **New Jersey**
 - Green power used for 12% of state government electricity needs
- **Pennsylvania**
 - Green power used for 5% of state government electricity needs

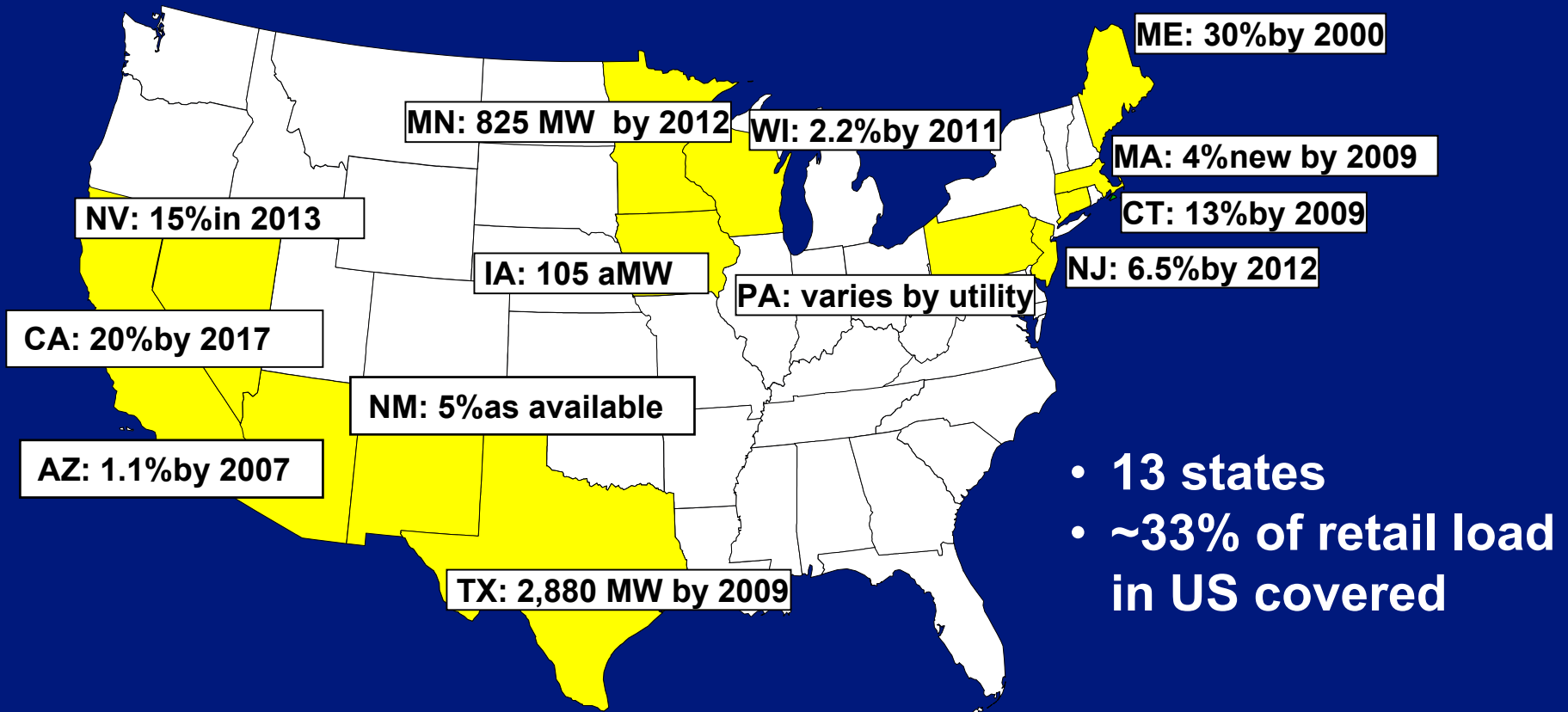


Municipal Green Power Purchase Commitments

- **Chicago + 48 local agencies**
 - 20% for municipal loads = 80 MW by 2005
- **Seattle**
 - City goal: no net increase in GHG emissions from electricity
 - 5% for entire utility system = 175 MW by 2004
 - Offers green pricing to customers
- **Austin**
 - 5% renewables supply goal for 2005
 - Now >85 MW from wind, landfill methane, and PV
 - Offers green pricing to customers



States with RPS Obligations



State Policies are Promoting New Renewables Development

- **Texas**

- More than 900 MW of new wind energy developed during 2001

Contributing Factors:

- RPS passed as component of 1999 electricity restructuring law
- Federal production tax credit for wind energy
- Favorable wind resources

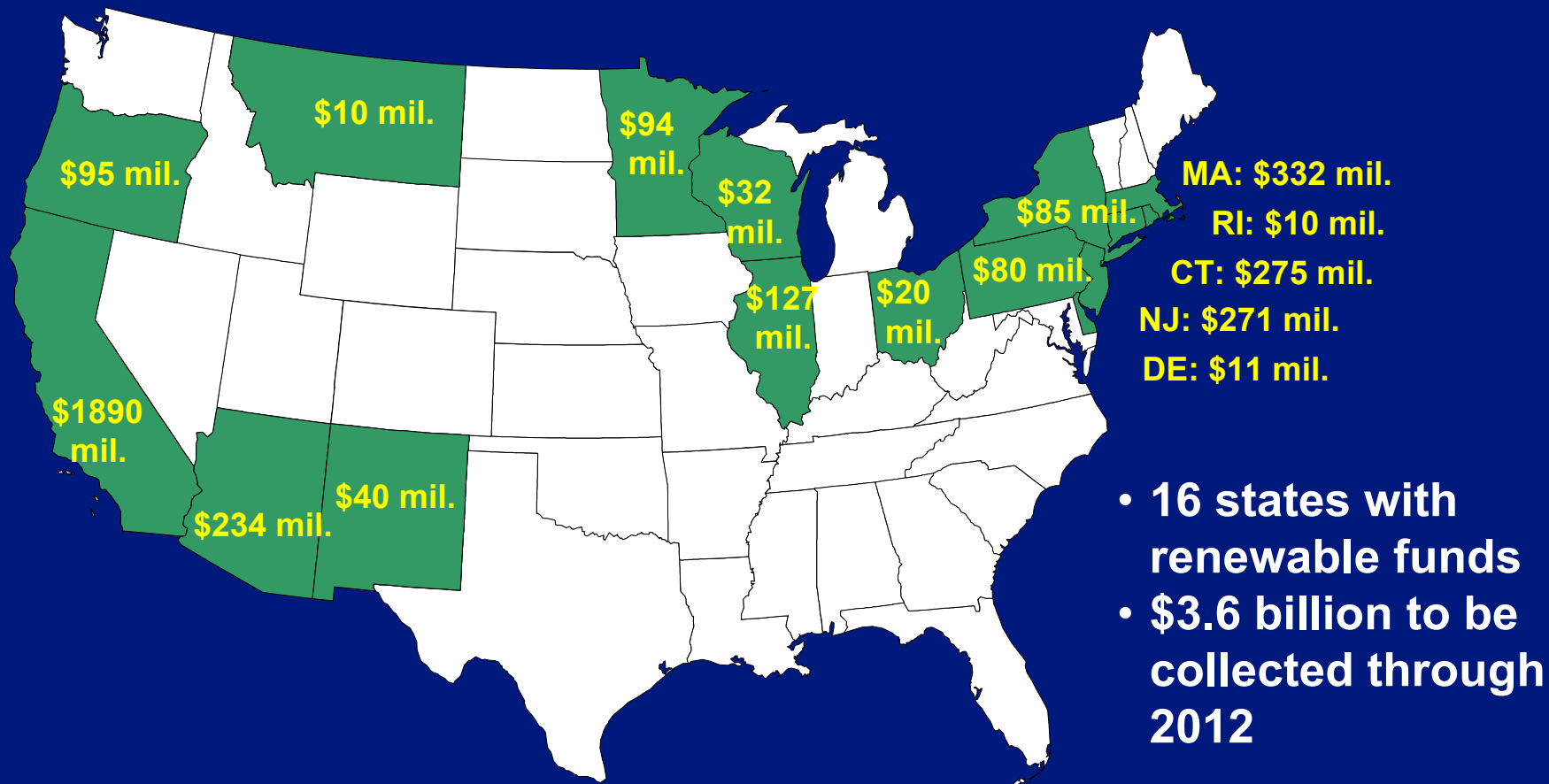


Desert Sky Wind Project - Texas (160.5 MW)



States with Renewable Energy Funds

Cumulative 1998-2012 (million \$)



State Policies are Promoting New Renewables Development

- **California**

- The number of grid-connected small solar and wind energy systems have increased several fold.

Contributing Factors:

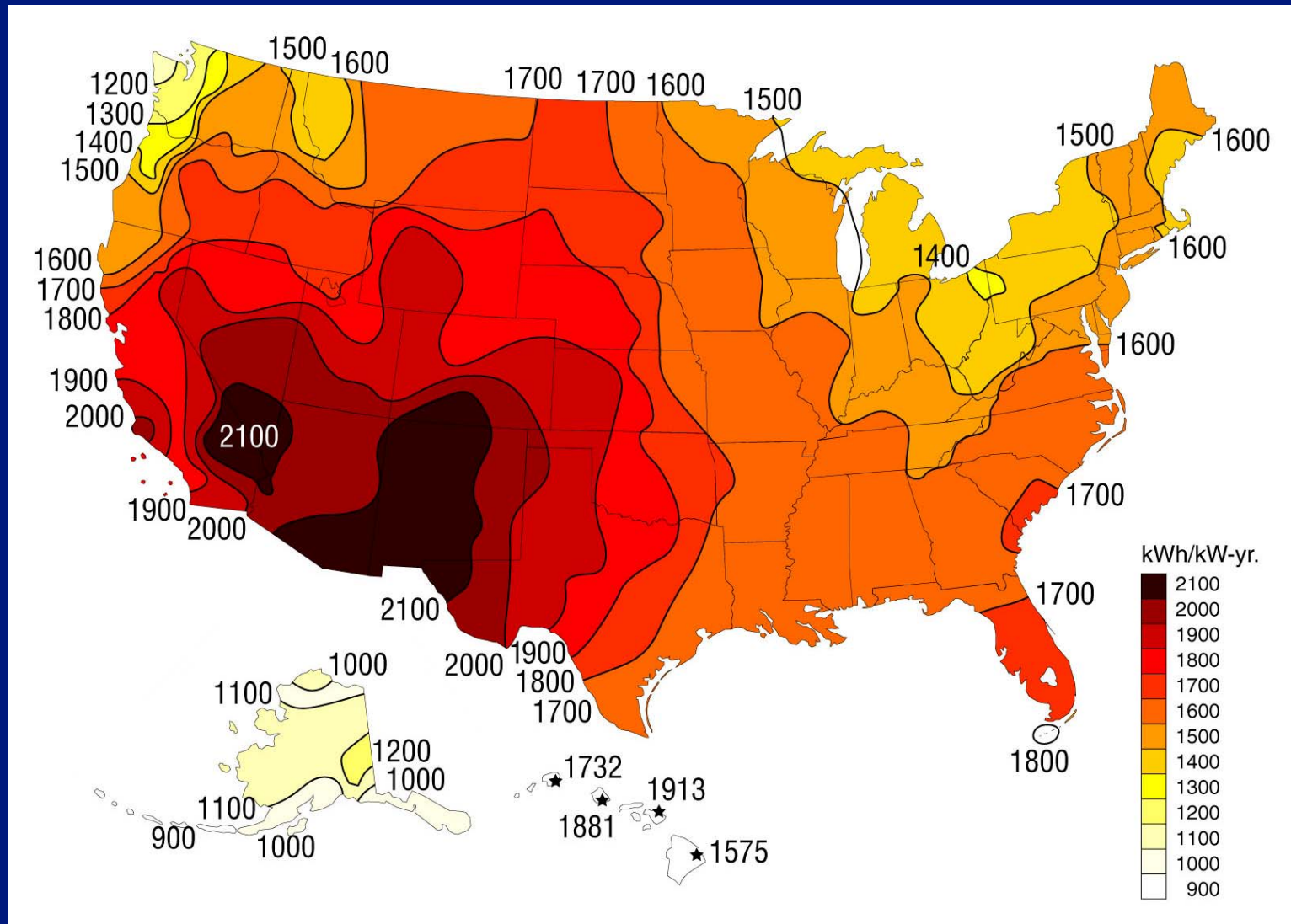
- SBC funding available for cash rebates
- Net metering available for system sizes up to 1 MW
- Federal solar tax credits for business investments
- “Electricity crisis” increased interest in customer-owned systems



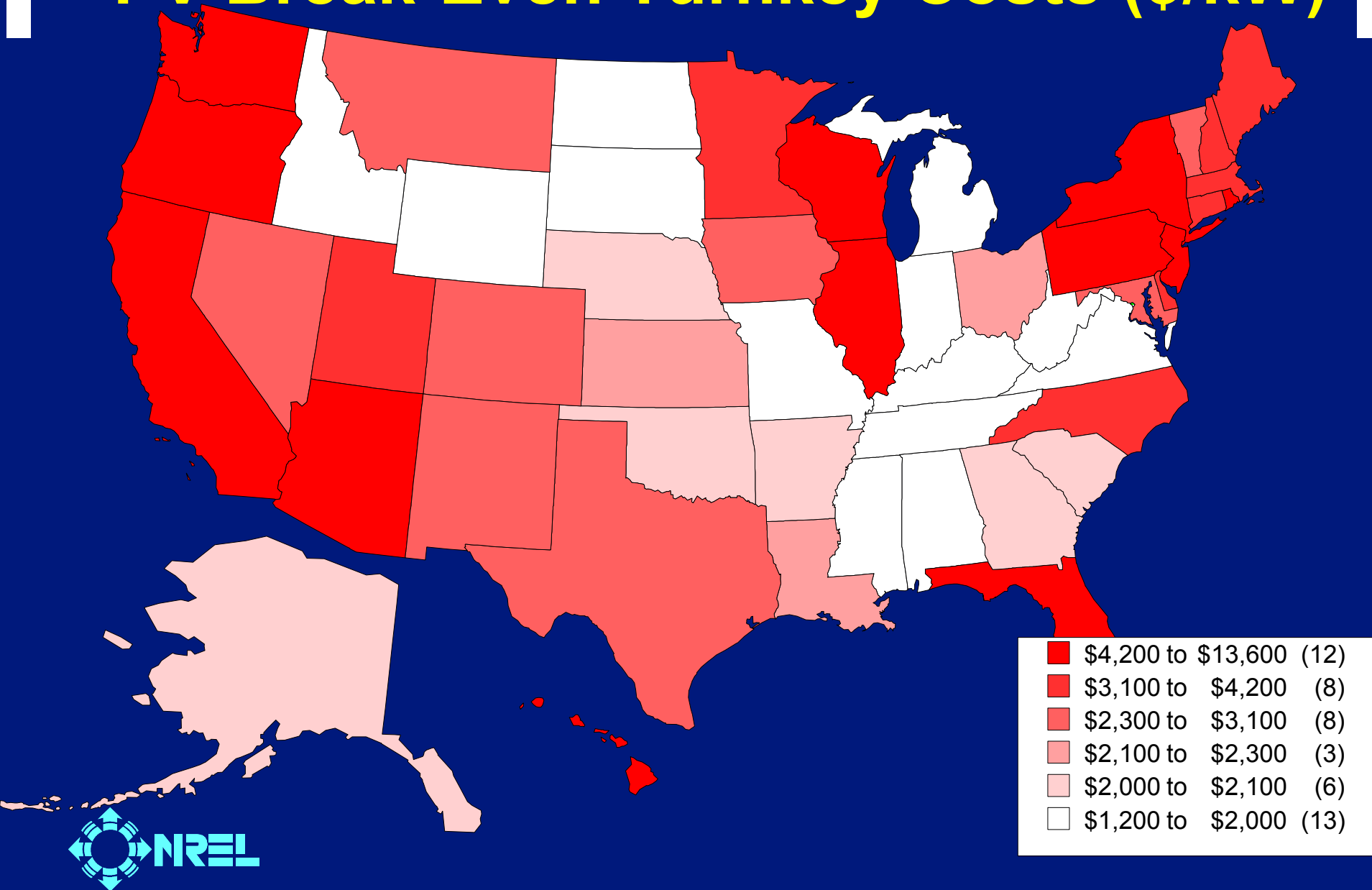
Santa Rita Jail - Alameda County, CA



PV Energy kWh/kW-yr



PV Break-Even Turnkey Costs (\$/kW)



Customer-Sited PV: Policy Matters

- Policy incentives are the major factor that determines the break-even turnkey cost
- Residential utility rates are a secondary factor
- Resource quality is of less importance
- C. Herig; S. Gouchoe; R. Haynes; R. Perez; T. Hoff (2002). “Customer-Sited Photovoltaics: State Market Analysis.”



Strategic Opportunities: SEPs

- ***Voluntary*** Project Agreed Upon In Enforcement Settlement Context
- Renewable Energy Supplemental Environmental Projects Are Allowed By EPA Policy (some States have SEP policies)
- Substantial \$\$ Possible
\$236.8 million dollars in 1999 federal EPA *settlements*



Renewable Energy SEPs

- Must Fit Into Settlement Process
- Greatest Value for Renewable Energy if SEP Funds Target Strategically Important Projects
- Assistance is Available
 - State Energy Offices
 - Wind Powering America Program
 - DOE/NREL SEP Workgroup
 - StEPP Foundation



Strategic Opportunities: Partners

- State and Local Governments
- National Assistance
 - EPA
 - DOE
 - National Renewable Energy Lab
- Private Sector (Businesses, Consumers)



Potential Areas for Collaboration with NREL

- Resource Assessment
- Technology Cost and Performance
- State & Local Technical Assistance
 - Project & Policy Case Studies
 - Local / Regional Benefits Case Studies
 - Training
- SIPs, Cap & Trade
- SEPs
- Voluntary Programs
- Information & Outreach



Contact Information:

Laura Vimmerstedt
National Renewable Energy Laboratory
1617 Cole Boulevard, MS - 2721
Golden, Colorado 80401-3393

phone: 303-384-7346

fax: 303-384-7411

email: laura_vimmerstedt@nrel.gov

